EXHIBIT 128
(Part 1 of 11)

MPR

1618-0001-RPT-001
Revision 1

Bellefonte Nuclear Power Plant Completion Project - Independent Engineer Evaluation Report

Prepared for: Nuclear Development, LLC

Preparer:	James Bubb	E-signed by: James Bubb on 2017-05-19 11:03:42
Preparer:	Samuel Steiman	E-signed by: James Bubb on behalf of Samuel Steiman on 2017-05-19 14:40:25
Preparer:	Robert Coward	E-signed by: Robert Coward on 2017-05-19 11:40:37
Reviewer:	Thomas Lubnow	E-signed by: James Bubb on behalf of Thomas Lubnow on 2017-05-19 11:50:59
Approver:	Thomas Lubnow	E-signed by: James Bubb on behalf of Thomas Lubnow on 2017-05-19 14:40:47

QA Statement of Compliance

This document has been prepared, reviewed, and approved in accordance with the Quality Assurance requirements of the MPR Standard Quality Program.

Created: 2017-05-19 11:03:42
Project-Task No. 16181701-0001

MPR Associates, Inc.
320 King St. • Alexandria, VA 22314
(703) 519-0200 • www.mpr.com

CONFIDENTIAL

Executive Summary

Purpose

This report presents the results of an Independent Engineer Evaluation of the project being planned by Nuclear Development LLC to complete the Bellefonte Nuclear Power Plant.

Background

Bellefonte Nuclear Power Plant, located in Hollywood, Alabama, is comprised of two partially complete pressurized water reactor (PWR) generating units, each equipped with a Babcock & Wilcox model 205 nuclear steam supply system (NSSS) with a total net electric output of about 1250 MWe (per unit).

The construction of Bellefonte Nuclear Power Plant was started by TVA in 1975 after the Construction Permit from the NRC was issued in December 1974. Construction continued through 1988 when TVA elected to stop construction. Several times since 1988 TVA has considered re-starting the project and completing one or both units. Studies and evaluations of the needed work were performed, along with some limited preliminary engineering, and advance procurement; however, no construction or refurbishment were performed. In addition to normal aging of the plant systems, structures, and components (SSCs) and alterations to support layup and preservations of systems and components, the key change in plant condition over time was an investment recovery program in the mid-2000s when a number of components were removed for use elsewhere in the TVA system or salvage. TVA made a final decision to permanently cancel future construction at Bellefonte and in the Fall 2016 entered into a contract to sell the asset to Nuclear Development LLC. Nuclear Development LLC is planning to resume and complete construction of both Bellefonte units.

When construction was stopped in 1988, the two units were considered to be about 90% and 60% complete (Units 1 and 2, respectively). The best estimates of the current status of the two units are about 55% and 35% complete (Units 1 and 2, respectively). These apparent steps backward are due to changes in material condition over time, the removal of some equipment, and evolving regulatory requirements.

Approach

The project to complete Bellefonte has been studied numerous times over the past ~25 years as TVA considered and deferred the project several times. As a result, TVA's planned execution approach for the Bellefonte Completion Project was fairly well defined at the time TVA elected to cancel the project. It is important to note, as described below, that the approach for the project pursued by Nuclear Development LLC will be slightly different due to differences in the business models between the two project sponsors.

Each of the previous studies by TVA over the years typically included:

- Refinement and investigation of the needed engineering, licensing, and construction activities (each study further refined this information)
- Consideration of changes to scope (usually consideration of modern technology such as digital instrumentation & controls or as a result of other design changes necessitated by evolving regulations)
- Consideration of changes to the execution plan, primarily the contracting, oversight, and work plan models
- Updating the cost estimate to reflect the refined scope, planned execution model, recent experience (e.g., unit rates), commodity and equipment costs, and labor rates
- Adjusting the execution schedule based on planned execution model, refined scope, and any financial constraints imposed due to cash flow limitations

The results of these activities are:

- The project scope, in particular the needed licensing, engineering, procurement, and construction, have been defined at a reasonably advanced level; but not completely.
- There are some areas of the scope that are less defined, typically due to open items, incomplete evaluations or analysis, or needed design development (TVA planned to close these gaps during the next phases of the project)
- The execution, contracting, and oversight model for the TVA approach are well defined
- The key risks, including licensing and execution, for the planned TVA project are well-defined
- A constrained schedule and (a likely bounding) estimated cost are defined for the TVA project

The scope of the planned project by Nuclear Development LLC is similar to the most recent version of the planned TVA project (and builds off it). However, there are some scope differences and more importantly, the project execution model will be different, as will the eventual operations model. The key differences between the planned Nuclear Development LLC project and the planned TVA project are summarized in Table ES-1.

Although the TVA version of the project has been studied in depth, each of the differences in Table ES-1 can impact the project execution model as well as the key project risks, the key milestones and decision gates, the cost and schedule, and the overall feasibility of the project. Thus, the available studies from TVA provide useful, but insufficient information to define and evaluate the planned Nuclear Development LLC project.

The purpose of this report is to present an evaluation of the feasibility of the Nuclear Development LLC version of the project, as well as to identify key strengths and risks.

Table ES-1. Project Execution Model Differences Driven by Ownership Change

Feature	Nuclear Development LLC	Most Recent TVA Approach
Overall Scope	Units 1 & 2 plus Common Systems	Unit 1 plus Common Systems
I&C Systems	Digital where not First-of-a-Kind (FOAK) Modern Analog for remainder	Digital for all Systems
Main Control Room	Upgraded	Completely Redesigned
Construction Permit Holder	Nuclear Development LLC	TVA
Operations & Maintenance	Established Nuclear Plant Operator as Operations Contractor	TVA
Operating License Holder	Nuclear Development LLC & Operations Contractor	TVA
Project Management	Oversight of Engineering, Procurement, & Construction (EPC) Contractor by Construction Management Contractor*	Owner Managed Project, Owner Oversight of EPC Activities
Technical Support Org	Established Nuclear Plant Operator as Operations Contractor*	TVA
AREVA Contracting (nuclear steam supply system)	Subcontractor to EPC Contractor	Contracted Directly by TVA
Fuel Procurement	Nuclear Development LLC and Operations Contractor Collaboration* (as part of fleet wide strategy)	TVA (as part of fleet-wide strategy)
Contracting Model	Firm Fixed Price or Guaranteed Maximum EPC Contract*	Owner Integration of Multiple Major Contracts (FP and T&M)
Quality Assurance	In Accordance with Operations Contractor QA Program	In Accordance with TVA QA Program
Funding Profile	Unconstrained – Selected to Optimally Complete Scope	Constrained to $750M/year
Funding Sources	Owner, Equity Investors, Debt (backed by DOE Loan Guarantee)	Utility "Pay-As-You-Go" Funding

* The Nuclear Development LLC model will include project execution, fuel services and operations contracts that have terms and conditions customary for project financed power projects. These terms relate to elements that include, but are not limited to: credit, performance and schedule guarantees and associated liquidated damages, intellectual property protection, etc., as would typically be required by the lender.

The study documented in this report focuses on the following activities/objectives:

1. Present the planned Nuclear Development LLC version of the Bellefonte Completion Project, including key elements of the scope and execution strategy (contracting, management, oversight, etc.).
2. Evaluate the status of engineering, construction, and material condition status of selected SSCs. This is accomplished by reviewing the available TVA documentation, determining the portions applicable to the Nuclear Development LLC project, performing (limited) independent assessments and walkdowns, and drawing conclusions regarding the expected remaining work scope for the systems, structures, and components (SSCs), as well as potential key open items or technical risks. The insights from selected reviews are used to assess the overall project scope and associated risks.
3. Evaluate the overall project execution model (contracting, organization, permitting, quality, division of responsibility, etc.) and identify the key risks. The focus of these evaluations is the "pivot" from the TVA project to the Nuclear Development LLC project since that change introduces new execution models and risks that were not evaluated previously by TVA.
4. Review the proposed schedule and associated key activities for the Nuclear Development LLC version of the project. Understand and assess the associated constraints and drivers imposed by the change in ownership. Review available studies for construction activities to assess practical implementation schedules.
5. Assess the feasibility of the overall project and provide recommendations for key risk management activities to increase confidence of project success.

A key strategy of this study is to leverage the existing TVA documentation as much as practical, and to perform additional independent evaluations and assessments that address the pivot to a new owner as well as to confirm the validity of the TVA information.

Conclusions

As a result of the TVA work over the past years, there is considerable information available to Nuclear Development LLC regarding the Bellefonte site, the B&W model 205 NSSS design, and the balance of plant design. There is also considerable information regarding the scope, needs, and risks for the project to complete the plant, as well as TVA plans to execute the project. This includes consideration of the experience gained during TVA's recent completion of Watts Bar Unit 2, a somewhat similar nuclear power plant completion project. These sets of information are valuable assets that benefit Nuclear Development LLC as it plans and executes the project. They are examples of the key strengths of the project execution plan being developed by Nuclear Development LLC.

Based on currently available information and evaluations of the Nuclear Development LLC Bellefonte Completion Project, we conclude:

1. It is feasible for the project to be completed as planned for the current budget of about $13.4B (including contingency, escalation, owner's costs, capitalized interest during construction, and other financing costs). MPR's review of the cost estimate indicates that

that the estimate likely includes embedded contingency in the individual estimate line items in addition to the explicit contingency of 25% of the total direct costs. The combination of embedded and explicit contingency likely exceeds the combined costs associated with some isolated, specific non-conservativisms identified in the MPR review of the estimates and costs associated with identified and unidentified risks. Accordingly, with effective execution the cost should be lower than the current $13.4B.

2. It should be feasible to complete the construction and field work on the current construction schedule for each unit of about four years from start of construction to fuel load. Nuclear Development LLC is planning a lag of 18 months between the Unit 1 and Unit 2 construction schedules; this could be challenging from a logistics perspective on site and determining the optimal lag should be a priority item during detailed planning.

3. Nuclear Development LLC plans to have design engineering substantially complete prior to beginning construction activities. We concur with this decision as perhaps the most significant action that can reduce risk. This will necessitate an engineering phase prior to construction activities. Based on our experience, the total duration of that phase is likely two years or more due to the extent of needed engineering. However, this phase is also an investment as we expect the final overall schedule and total cost to be reduced as a result of better planning and substantial reduction of rework and elimination of risks during construction. Further, this phase will also provide sufficient time to advance the I&C and simulator designs which are likely on the overall critical path. Potential options to accelerate the project schedule through proper sequencing of the engineering scope should be a priority item during detailed planning.

4. The Nuclear Development LLC project schedule will need to allow for an upfront project development phase to arrange needed contracts and secure financing. The schedule for that phase is not possible to determine in this evaluation as it will be strongly driven by the complications of negotiation of contracts of this nature and the current risk environment for nuclear plant construction contracting.

The conclusions summarized above are based on the following key enabling assumptions:

- The planned Nuclear Development LLC project execution model is implemented
- The contractors and members of the Owner's organization effectively execute their scope and responsibilities, particularly the Operations Contractor and Construction Management
- The Lead EPC Contractor has appropriate nuclear construction and 10CFR50, Appendix B experience
- The Lead EPC Contractor has appropriate engineering, procurement, and construction experience
- The key scope open items are evaluated and resolved prior to firming the EPC cost
- All engineering that can affect the design of SSCs is substantially complete before beginning field refurbishment, replacement, and construction activities
- The EPC Contractor performs adequate planning prior to beginning field work

- The likely critical path instrumentation and controls (I&C) and simulator activities to support operator training are initiated at the time that advance engineering and planning are started

Key Observations

TVA, along with numerous outside evaluations, concluded that the TVA version of the Bellefonte Completion Project was feasible. Much of those results and conclusions apply to the Nuclear Development LLC project. However, there are four key differences between the planned TVA project and the project planned by Nuclear Development LLC that can affect the plans and risks of the project in a meaningful way.

- **Increased use of fixed-price contracts.** TVA was planning to directly manage the project (as the Owner), with the key contractors on cost-plus (or similar) contracts. The TVA scoping studies, cost estimates, and planning studies were developed based on that assumption, with plans to incrementally de-risk the project over time as a series of decision gates were reached. It was understood there was an uncertainty band on the cost and schedule estimates and that those bands would narrow as engineering was completed. Further, it was understood that the key drivers of the uncertainty were the open/unresolved items in the planning packages, the incomplete design changes, the incomplete analyses to support key assumptions, and achieving final agreement with NRC on the evolved plant design in a new regulatory environment. Much of the scope was known and scoped, but not all.

  Nuclear Development LLC plans for a single EPC Contractor to be on a guaranteed maximum price or fixed price contract. The status of the TVA planning was adequate at that point for the TVA model, but there are open items and as yet incomplete work areas that would need to be completed for an EPC Contractor to firm a reasonable price. The available TVA information will be useful to the EPC Contractor; however, we expect the contractor to require additional planning work to close open items and to complete a substantial amount of engineering work to firm the scope prior to firming a cost without extreme contingency. The Nuclear Development LLC execution model will need to include the time for that phase. That phase is also expected to result in overall cost reductions as uncertainties are removed and the project is de-risked prior to construction activities.

- **Changes to I&C design.** TVA was planning to replace all I&C systems and platforms with digital equipment, as well as completely renovate and redesign the main control room with modern displays and human-machine interface systems. For risk mitigation purposes, Nuclear Development LLC plans to upgrade only selected systems and platforms to digital and to make incremental changes to the main control room (only upgrade systems that have been successfully licensed and installed in peer B&W model 177 NSSS plants). We concur with this decision due to significant licensing, cost, and schedule uncertainty with a complete upgrade.

  There is considerable planning and study information for the "all-digital" option, some of which will be useful to Nuclear Development LLC. However, the details of the plan to

be pursued by Nuclear Development LLC are not complete and considerable study and planning work is needed to develop the specifics of the hybrid approach for control systems and the main control room. This work is crucial given the likely potential for it to be near or on the project critical path. Control systems design to control room design to simulator development to operator training and qualification is a likely critical or near-critical path for this project as it is for most nuclear plant construction projects. From a practical perspective, until this work is completed, it will be difficult to firm a full scope and final schedule without significant contingencies and margins.

- **Two Units.** Nuclear Development LLC plans to complete both Bellefonte units. The most recent and most detailed TVA studies only considered completing Unit 1. The engineering status and needs for Unit 2 will be comparable to Unit 1. The material condition of Unit 2 is also expected to be similar to Unit 1, but has not been documented and evaluated in detail, increasing scope uncertainty. Also, Unit 2 is less complete than Unit 1. These unit-to-unit scope differences and uncertainty will need to be resolved with higher confidence and rigor prior to finalizing an overall scope, plan, and cost.

- **Operations Contractor & Construction Manager.** Nuclear Development LLC is planning to contract with a current fleet operator of nuclear power plants to perform the operations and maintenance of Bellefonte as well as provide some of the owner's functions during the completion project. Much of the Bellefonte and project infrastructure is expected to be built on and around the Operations Contractor infrastructure (including important programs like Quality Assurance, Safeguards, etc.). Also, Nuclear Development LLC plans to contract with one or more companies experienced in oversight and management of nuclear plant construction (a Construction Manager) to provide management, commercial and technical oversight of the EPC Contractor (working along with Nuclear Development LLC direct hires). The Operations and Construction Management contractors may or may not be the same company. Considerable effort is needed to finalize the detailed plans for the Owner's organization and how the project will be executed. Those details can impact the EPC contract and other elements of the project that could affect risks, cost, and/or schedule. Further, those details and getting the Operations Contractor under contract could affect the schedule for transferring the NRC Construction Permits from TVA to Nuclear Development LLC (those efforts have been started).

These key observations listed above do not directly impact the feasibility of executing the project work scope (only potential impacts on project schedule and/or cost).

DOE Loan Guarantee Program Considerations

Table ES-2 lists the typical areas of interest for evaluation of a US DOE Loan Guarantee along with the key information for each area and applicable reference to locating the detailed evaluation/discussion in this report.

Key Results Summary

Key evaluation results and observations for important areas of the project are summarized below. Additional information regarding eventual plant operations is provided in the body of this report.

Nature of Project Scope

Although commonly referred to as an engineering and construction project, realistically the Bellefonte Completion Project is primarily a component replacement and refurbishment project. There is also some limited bulk construction scope to complete portions of Unit 2. All of this work is preceded by the engineering needed to reconstitute portions of the plant design and licensing bases, evolve the design as well as analysis tools, methods, and documentation to meet current regulatory expectations, evaluate refurbish-or-replace decisions, and develop necessary design changes. Because of the limited bulk construction, it is important to identify and apply appropriate experience, unit rates, and productivity assumptions. "Standard" construction unit rates likely do not apply. For similar reasons, conventional work planning approaches may not be applicable. The TVA Watts Bar Unit 2 productivity and unit rates used to support the current Bellefonte estimate factor in some of these inefficiencies. However, the selected EPC contractor will require a significant effort in the pre-construction period to develop its own high level of confidence in the bases for the estimate.

Owner Organization

Nuclear Development LLC plans to contract most of the owner organization functions and rely on contractor infrastructure for back-office and administrative support. This approach will allow Nuclear Development LLC to design a project execution, project management, and project oversight model tuned to the Bellefonte Completion Project. Capable contractors are available for all needed roles. With proper contractor selection and contracting, proper planning, and proper oversight, the project execution plan should support project success.

Permits and Licensing

The permits and licenses needed to complete Bellefonte are well defined, and are either in-hand with TVA (and transferrable) or should be achievable on the needed schedule. A particular item for increased attention is the Unit 2 Construction Permit from the NRC. It is presently in a somewhat undefined state since TVA submitted an extension request, then asked the NRC to not review the application, but it was not withdrawn. The permit must be properly extended and then transferred to Nuclear Development LLC. Transferring the permit (as well as the Unit 1 permit) will require Nuclear Development LLC to complete certain activities to establish itself as a capable holder of an NRC Construction Permit. Building a strong relationship with the NRC will be important.

Project Scope Definition

Much of the project scope (engineering, procurement, refurbishment, and construction) is defined in existing studies prepared by TVA. These studies evaluate the engineering status, regulatory considerations, the construction completeness, and material condition, and determine the needed engineering, and field activities (refurbish, replace, or install components and

equipment). Detailed studies are available for numerous systems and programmatic topics. These provide a basis for a portion of the overall cost estimate.

Although detailed and reasonably current studies are available for many systems and topics, the scope of those systems represent only about 65% of the total estimated cost. The remainder of the cost estimate is based on older, less refined scoping and planning. Further, many of the studies identify open items and/or additional work needed to firm and refine the needed project scope for the system or topic. Finally, detailed evaluations are not available for Unit 2 (at this time, the Unit 2 costs are estimated by reasonably scaling the Unit 1 costs based on assumptions of original completion status and similar material condition and modernization activities). As a result, it is not reasonable at this time to expect a contractor to provide a firm, fixed price for the entire scope (without significant and unacceptable contingencies). Additional engineering and planning is needed to finalize the overall work scope. Also, we expect the EPC Contractor will strongly desire to substantially complete all design engineering prior to firming the price and starting construction. Without the upfront engineering phase, any EPC Contractor firm pricing would have very large contingencies and margins.

Base Technology

Bellefonte Units 1 and 2 are based on the B&W model 205 NSSS design. Although there is no currently operating plant of this particular model (a plant was constructed and operated in Germany, but decommissioned for administrative reasons), this design is an evolutionary and advanced design from the B&W model 177 NSSS design which has been safely, reliably, and successfully operated in the US for decades. There are no significant concerns with the plant design or base technology.

Potential Technical Issues

Over the years, several specific technical issues were identified in the TVA studies. Over that same period additional study, investigation, and analysis were performed to understand the issues and develop (and in some cases begin implementing) resolution plans. At this time, no specific technical issues are considered major threats to project feasibility. Several will require resolution with the NRC, so there could be some schedule delays due to protracted NRC interactions. Resolution should be achieved with proper engagement and licensing attention; however, Nuclear Development LLC will need to pay prioritized attention to these items to confirm this conclusion.

The technical issues with greatest risk to extend the project due to interaction with NRC and/or completion scope changes include:

- Digital I&C – Bellefonte will include some digital I&C platforms and systems. This remains a controversial topic in the domestic nuclear power industry as industry and NRC strive to agree on approach and requirements. Further, the Nuclear Development LLC plan to implement a hybrid I&C approach has not been developed in detail. Successful experience exists at operating B&W model 177 NSSS units (e.g., Duke at Oconee and Exelon at TMI-1) and that experience will be helpful; however, the full plan for Bellefonte needs to be developed and all risks identified and managed.

- Seismic – New seismic load definitions have been developed for the Bellefonte site. These will be used in the building models and eventually to evaluate SSCs. Scoping evaluations by TVA suggest the implications of the change on the actual design and construction of the plant and on component procurement will be small. However, that assumption must be verified. Further, the NRC tends to have deep interest in the analyses to generate new building floor response spectra and consider effects such as soil-structure interaction.

- Cable – the TVA planning was based on assumptions that the condition of all plant cables could be extrapolated from a small testing and evaluation sample. Additional testing will be performed to confirm this assumption. The results could yield the need to replace more cable than presently planned.

- Programs – Performing nuclear construction requires functional programs for 10CFR50 Appendix B, for Safety Conscious Work Environment, for control of Safeguards Information, and for various technical areas. The NRC will carefully scrutinize how these programs are implemented due to the non-traditional project organization planned by Nuclear Development LLC.

Estimated Project Cost

Nuclear Development LLC is planning a project budget of about $13.4B, including contingency, escalation, and capitalized interest during construction, but not including the cost of the initial fuel load. This value is essentially the final TVA cost estimate adjusted to add Unit 2.

Reviews of the available scoping packages and vertical slice reviews of selected system packages indicate that typically (1) there is considerable information and bases, but (2) there are also open items and needed design work. As a result, there is both examples/areas of certainty in the scope and cost estimate as well as examples/areas of uncertainty. Also, there are instances, particularly in the Engineering scope, where the cost estimate appears very high. This is not unusual given the maturity of the project and basis of estimate (the bases information is the equivalent of a Class 3 estimate).

MPR's review concludes that the cost estimate accuracy range aligns most closely with a Class 3 estimate using AACE guidelines. Although a Class 3 estimate typically has an uncertainty range of about +20% / -15%, this project includes a higher level of contingency than recommended in the AACE guideline, and some of the cost estimate elements appear to be based on conservative assumptions, likely resulting in some "embedded contingency" in the estimate. Consequently, we conclude it is unlikely that the costs will exceed $13.4B. This maximum value will be confirmed by the EPC Contractor when their review of the basis of estimate is completed, and after the price controls included in the EPC Contract are finalized.

Estimated Project Schedule

A detailed project schedule has not yet been developed by Nuclear Development LLC. The preliminary project schedule plans for approximately 4 year construction schedules for both Unit

1 and Unit 2 with an 18-month lag between units. MPR's review of the preliminary schedule yields the following observations (based on available information):

- Upfront Planning and Engineering phases are needed prior to construction to plan, firm the scope, and de-risk the project. Combined, these phases are likely to require longer than two years of duration.
- A 4-year construction schedule for Unit 1 is a reasonable target and is likely achievable.
- A 4-year construction schedule for Unit 2 could be more difficult and depends on finalizing the Unit 2 scope plus the lag between units. Achieving 4-years on both units with only an 18-month lag could be difficult simply from the logistical aspects of that many people working efficiently on site at the same time.
- The critical path to completing Unit 1 likely goes through I&C system design, human factors engineering, main control room design, simulator design and fabrication, and operator training and qualification.

The result is about six years to fuel load for Unit 1. When Nuclear Development LLC develops a detailed project schedule, opportunities to optimize the activities along the project's critical path should be explored to evaluate opportunities to reduce the overall project duration.

Finalization of Required Project Agreements and Contracts

Numerous project agreements and contracts will need to be executed to enable project execution using a project-finance approach. Nuclear Development LLCs plans to execute the following necessary agreements prior to Loan Closure.

- Operations Agreement
- Construction Management Agreement
- EPC Agreement(s)
- Fuel Supply Agreement(s)
- Transfer of Permits
- Agreements as necessary with suppliers of specialty services
- Transmission System Interconnection Agreement
- Power Purchase Agreement (not in scope of this review)

Based on our discussions with Nuclear Development LLC's, we find their plans to develop the contracts are reasonable, and conclude there are qualified parties to provide each on these needed project elements.

Note

The Nuclear Development LLC Bellefonte Completion Project is in a transition phase, determining how to best leverage significant prior work by TVA. As a result, key contracts are not in place, and in some cases the contractor is not selected yet (although there are credible options for all scopes/roles). Based on this status:

1. This evaluation was performed based on the assumption that the project scope, contracting, management, and oversight are consistent with the current plans, and that the capabilities of

the key contractors are consistent with those assumed in this evaluation. Any changes from the planned project models could affect the results of this evaluation.

2. This evaluation is an initial assessment of the planned project based on available information.

3. This evaluation focuses on the scope to complete the Bellefonte units and prepare them for operations. Nuclear Development LLC plans to contract with an established fleet operator of nuclear power plants to perform the operations and maintenance for the units. This evaluation assumes that there is minimal risk associated with the Operations Contractor operating the units once completed (and that the contractor has adequate time to prepare for those operations).

Table ES-2. Typical DOE Loan Guarantee Evaluation Areas

Area	Report Section(s)	Summary
Base Technology	1 App C	The Bellefonte design is based around the B&W model 205 NSSS design, an evolutionary advancement from the B&W model 177 NSSS design. The model 205 Mulheim-Karlich plant (in Germany) was completed and operated until an administrative decision to cease operations. Model 177 design plants have operated safely and reliably in the US for decades at the Oconee, ANO, Davis-Besse, Crystal River, and Three Mile Island sites
Project Feasibility	2	Much of the construction of the two units is complete (about 55% for unit 1 and 35% for unit 2), including essentially all safety-related structures. The remaining project has been mostly scoped by TVA and those planning studies are available to Nuclear Development LLC. Assuming capable contractors are used in roles that align with their areas of strength, adequate project planning, substantial completion of engineering prior to construction, plus adequate project leadership, it should be feasible to complete the project for less than the budget planned by Nuclear Development LLC and on a construction schedule about that planned by Nuclear Development LLC (with a later planned completion due to an added upfront engineering phase).

Area	Report Section(s)	Summary
Engineering and Design Approach	7	Much of the engineering scope was completed by TVA prior to 1988 when the project was deferred. However, in the interim NRC regulations and expectations have evolved, and all post-TMI and post-Fukushima design changes have not been implemented. Also, there are questions about design control and the impact of replacing equipment removed for salvage and to refurbish or replace existing equipment that degraded over time. As a result, engineering remains to: • Ensure compliance with all applicable post-TMI and post-Fukushima regulatory requirements • Establish the design and licensing bases for a portion of the plant design and maintain it for the entire plant • Properly incorporate any design changes • Prepare procurement and construction specifications, drawings, and associated products • Perform engineering planning to support scope definition and implementing contracts A key element of the project risk management approach is to substantially complete all necessary engineering for construction prior to beginning field construction activities.
Integrated Project Schedule	12	A detailed project schedule has not yet been developed by Nuclear Development LLC. The preliminary project schedule plans for approximately 4 year construction schedules for both Unit 1 and Unit 2 with an 18-month lag between units. Based on this evaluation: • Upfront Planning and Engineering phases are needed prior to construction to plan, firm the scope, and de-risk the project. Combined, these phases are likely two years in duration or longer. • A 4-year construction schedule for Unit 1 is a reasonable target and is likely achievable. • A 4-year construction schedule for Unit 2 could be more difficult and depends on finalizing the Unit 2 scope plus the lag between units. Achieving 4-years on both units with only an 18-month lag could be difficult simply from the logistical aspects of that many people working efficiently on site at the same time. The critical path to completing Unit 1 likely goes through I&C system design, human factors engineering, main control room design, simulator design and fabrication, and operator training and qualification.

Area	Report Section(s)	Summary
Cost Estimates and Technical Input to the Financial Model	13	The current estimate of about $13.4B is a reasonable upper target for planning based on current project maturity. There are threats that could increase the cost, including areas of unknown or potentially emergent scope. There also appear to be opportunities to reduce the cost, perhaps significantly in some areas. With excellent planning and execution, it is likely for the final cost to be lower than the current estimate. Based on the state of the engineering packages, opportunities exist to focus near term activities on the high priority work that will reduce uncertainty and provide a higher confidence cost estimate.
Contractual Requirements and Arrangements	4	Early in the project life cycle, no key contracts are in place. Nuclear Development LLC plans key contracts with: • An EPC Contractor to perform EPC activities • An Operations Contractor to operate and maintain the plant as well as provide technical support and oversight for the EPC Contractor • A Construction Manager to provide commercial oversight and support for the EPC Contractor • Fuel related contracts • Transmission system interconnection agreement • Specialty contractors for selected and narrow scopes of work Among these contracts the EPC contract will be most challenging, in part due to current challenges with other domestic nuclear construction projects. Nuclear Development LLC will also need contracts with off-takers of the power. That is outside the scope of this evaluation.
Proposed Supply Chain	8	Nuclear Development LLC plans to contract an experienced EPC company to take lead responsibility for procurement and construction activities, including procurement of necessary equipment, commodities, and services. There are numerous credible options for most procurements.
Project Risks, including Mitigation Activities and Milestones	11	Key project risks have been identified along with preliminary mitigation activities. The primary threats and risks are: • Uncertainty in the project scope due to Engineering open items and needed design changes • Incomplete planning for I&C systems • Uncertainty in the Unit 2 material condition status and scope • Executing all necessary contracts

Area	Report Section(s)	Summary
Direct Labor Requirements During Construction and Operation	8.3 12	The current cost estimate includes the following labor requirements during construction: • Direct Craft: 21 million hours for two units (primarily pipefitters and electricians) • Indirects: 9.4 million hours for two units • Non-Manuals: 7.8 million hours for two units The direct labor needed during operation was not estimated in this evaluation since Nuclear Development LLC is planning to contract with an established fleet operator of nuclear power plants and that Operator will have the necessary expertise for recruiting and assembling a plant staff. Also, the nuclear power industry is presently implementing a program to reduce staff requirements, so that topic was not assessed.
Siting and Permitting	6	All necessary permits and licenses to complete the Bellefonte Nuclear Power Plant are known, with most in-hand at TVA and transferrable, or they should be achievable without undue challenges.
Testing and Commissioning	9	Bellefonte units 1 & 2 are evolutionary designs developed from the B&W model 177 NSSS design that has operated reliably elsewhere. The start-up testing and commissioning plan will be developed based on the start-up testing experience at those units and the operating experience since start-up. First-of-a-kind and first-in-a-while scope will be identified and special test plans developed for those components and systems. The testing and commissioning schedule allows sufficient time for all required testing.
Operation and Maintenance	14	Nuclear Development LLC plans to contract with an established fleet operator of nuclear power plants to provide operations and maintenance of the plant as part of their fleet.
Decommissioning Plan and Costs	15	The detailed Decommissioning Plan will be developed during construction by the Operations Contractor. Nuclear Development LLC plans to meet all applicable NRC requirements for restoration of the site and funding.